A High Efficiency 1kWatt GaN Amplifier for P-Band Pulsed Applications, Phase I

Completed Technology Project (2013 - 2013)

Project Introduction

An improved efficiency amplifier for high power pulse applications at P-Band will be investigated that will support space based RADAR systems. Current P-Band pulsed amplifier technologies use Silicon Bi-polar and LDMOS device technologies that have increased internal device parasitic characteristics that lead to lower gain and more difficult power matching over GaN technologies. Integra Technologies has experience with all three device technologies. Integra also has the design and manufacturing processes in place to optimize transistor design and amplifier design for P-Band pulsed applications. The preliminary effort will investigate GaN devices at 150W (TBD) levels to determine the overall gain and efficiency at UHF frequencies using Class AB bias and Switch Mode matching techniques to achieve greater than 70% efficiency for a pulsed amplifier application. Longer term device investigation will include geometry modifications to optimize the chip size and cell dimensions for the P-Band RADAR application. Ultimately, the GaN device will be scaled into a target 1kWatt output stage with an appropriate driver device to enable a greater than 40dB gain amplifier. The final amplifier module will include bias modulation techniques for efficiency. The amplifier will include material selections and layout techniques for reliability under high RF energy signal levels and low pressure environments.

Primary U.S. Work Locations and Key Partners

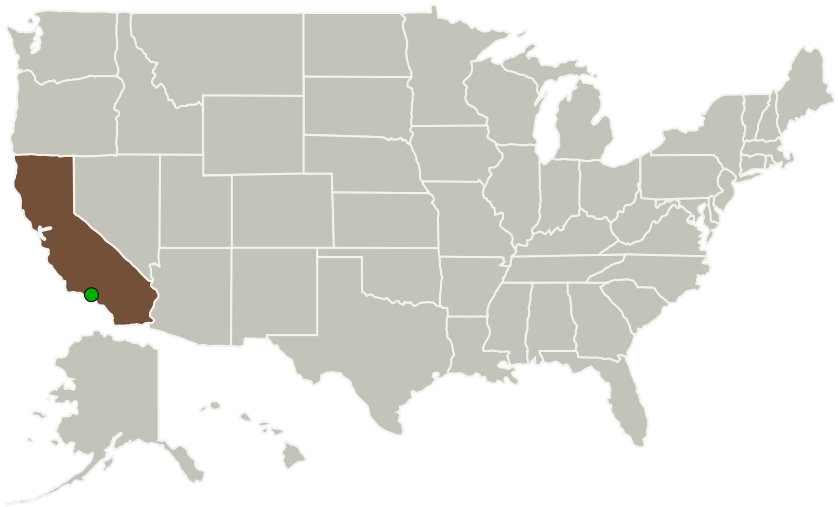

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Table of Contents

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Organizations Performing Work	Role	Type	Location
Integra Technologies, Inc.	Lead Organization	Industry	El Segundo, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

June 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140467)*

Images

Project Image
A High Efficiency 1kWatt GaN amplifier for P-Band pulsed applications
(https://techport.nasa.gov/image/135817)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Integra Technologies, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

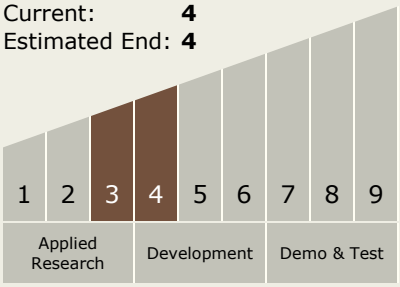
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
James Custer

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System